REMARKS

Claims 1-24 were examined. Claims 1, 4-6, 8-11, 13-16, 18-20, and 22-24 are amended. Claims 2-3 are canceled. Claims 1 and 4-24 remain in the Application.

The Patent Office rejects claims 1-24 under 35 U.S.C. §102(b) and §102(e). Reconsideration of the rejected claims is respectfully requested in view of the above amendments and the following remarks.

A. 35 U.S.C. §102(b): Rejection of Claims 1-24

The Patent Office rejects claims 1-24 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6,358,832 issued to Edelstein et al. (Edelstein). Applicants believe the proper Edelstein reference is U.S. Patent No. 6,153,935 which contains a similar disclosure.

Independent claim 1 is not anticipated by Edelstein, because Edelstein fails to describe forming a conductive shunt structure through a chemically-induced oxidation-reduction reaction comprising introducing a shunt material precursor in the presence of an alkaline metal-free reducing agent. In the '935 Patent, Edelstein described an electroless process for forming barrier cap 24 and describes "a reducing agent". Col. 8, lines 1-3. One advantage to the alkaline metal-free reducing agent described in Applicants' application is that the plating bath, for example, does not contain potassium or sodium that might contaminate the plated material.

Claims 4-14 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 4-14 are not anticipated by Edelstein.

Independent claim 15 is not anticipated by Edelstein, because Edelstein does not describe introducing a conductive shunt material in an opening including a via and trench; introducing an interconnect material on the conductive shunt material; and introducing and reducing an oxidation number of a shunt material precursor on an exposed surface of the interconnect structure. Edelstein describes a diffusion barrier cap placed on an exposed surface of an interconnect structure. The cap material is not placed in the via and/or trench.

Claims 16-24 depend from claim 15 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 15, claims 16-24 are not anticipated by Edelstein.

Applicants respectfully request that the Patent Office withdraw the rejection under 35 U.S.C. §102(b) of claims 1 and 4-24.

B, 35 U.S.C. §102(e): Rejection of Claims 1-24

The Patent Office rejects claims 1-24 under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,350,687 issued to Avanzino et al. (Avanzino).

Independent claim 1 is not anticipated by Avanzino, because Avanzino does not describe forming a conductive shunt material structure by introducing a shunt material precursor in the presence of an alkaline metal-free reducing agent. Avanzino describes electroless plating of a passivating layer on a copper layer. Avanzino does not describe the specifics of its electroless process.

Claims 4-14 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 4-14 are not anticipated by Avanzino.

Independent claim 15 is not anticipated by Avanzino, because Avanzino does not describe introducing a conductive shunt material in an opening including a via and trench; introducing an interconnect material on the conductive shunt material; and introducing and reducing an oxidation number of a shunt material precursor on an exposed surface of the interconnect structure. Avanzino describes a passivating layer placed on an exposed surface of an interconnect structure. The passivating layer is not placed in the via and/or trench.

Claims 16-24 depend from claim 15 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 15, claims 16-24 are not anticipated by Avanzino.

Applicants respectfully request that the Patent Office withdraw the rejection under 35 U.S.C. §102(b) of claims 1 and 4-24.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

Respectfully submitted,

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Date: 7/8/02

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on July 8, 2002.

Nedy Calderon 7/8/02

Nedy Calderon Date

ATTACHMENT: VERSION WITH MARKINGS TO SHOW CHANGES MADE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please cancel claims 2 and 3.

1. (Amended) A method comprising:

~~introducing~~ forming a portion of an interconnect structure in an opening through a dielectric over a contact point; and

~~introducing~~ forming a conductive shunt ~~material~~ structure adjacent the portion of the interconnect structure through a chemically-induced oxidation-reduction reaction comprising introducing a shunt material precursor in the presence of an alkaline metal-free reducing agent.

4. (Amended) The method of claim ~~2~~1, wherein ~~introducing~~ forming the shunt ~~material precursor~~structure comprises introducing the shunt material precursor in the presence of a non-metallic chelating agent.

5. (Amended) The method of claim 1, further comprising:

~~introducing~~ forming the shunt ~~material~~ structure in an alkaline environment with a pH adjusted by an alkaline metal-free pH adjuster.

6. (Amended) The method of claim 1, further comprising:

prior to ~~introducing~~ forming the shunt ~~material~~structure, modifying the exposed surface of the interconnect structure.

8. (Amended) The method of claim 1, wherein ~~introducing~~ forming the interconnect structure comprises introducing a barrier material and an interconnect material, and the introduction and reduction of the shunt material precursor precedes the ~~introduction~~ forming of the interconnect material.

9. (Amended) The method of claim 8, wherein ~~introducing~~ forming the interconnect structure further includes introducing a seed material following the introduction of the barrier material.

10. (Amended) The method of claim 8, wherein the opening through the dielectric material comprises a via having a cross-sectional area and a volume, and a trench to the via having a cross-sectional area greater than the cross-sectional area of the via, and introducing the shunt material precursor comprises introducing the shunt material ~~to~~ precursor in an amount such that the shunt structure thus formed substantially ~~fill~~ fills the volume of the via.

11. (Amended) The method of claim ~~21~~ 1, wherein ~~introducing~~ forming the shunt ~~material~~ structure comprises:

placing a substrate comprising the interconnect structure in a bath comprising the shunt material precursor.

13. (Amended) The method of claim ~~21~~ 1, wherein ~~introducing~~ forming the shunt ~~material~~ structure comprises:

dispensing the shunt material precursor onto the interconnect structure.

14. (Amended) The method of claim ~~21~~ 1, wherein ~~introducing~~ forming the shunt ~~material~~ structure comprises:

placing a substrate comprising the interconnect structure in a wafer scrubber; and

while in the wafer scrubber exposing the interconnect structure to the shunt material precursor.

15. (Amended) A method comprising:

introducing ~~an interconnect structure~~ a conductive shunt material in an opening through a dielectric ~~over~~ to a contact point, wherein the opening defines a via having a cross-sectional area and a volume, and a trench to the via having a cross-sectional area greater than the cross-sectional area of the via;

introducing an interconnect structure material on the conductive shunt material;

introducing a conductive shunt material precursor having an oxidation number ~~over~~ on an exposed surface of the interconnect structure; and

reducing the oxidation number of the shunt material precursor.

16. (Amended) The method of claim 15, further comprising prior to reducing the oxidation number of the shunt material precursor, introducing a reducing agent.

18. (Amended) The method of claim 15, further comprising:

reducing the oxidation number of the shunt material precursor in the presence of a non-metallic chelating agent.

19. (Amended) The method of claim 15, further comprising:

reducing the oxidation number of the shunt material precursor in an alkaline environment.

20. (Amended) The method of claim 15, further comprising:

prior to introducing the shunt material precursor, modifying the exposed surface of the interconnect structure.

22. (Amended) The method of claim 15, wherein introducing the interconnect structure comprises introducing a barrier material and an interconnect material~~, and the introduction and reduction of the shunt material precedes the introduction of the interconnect material~~.

23. (Amended) The method of claim 22, wherein introducing the interconnect structure material further includes introducing a seed material following the introduction of the barrier material.

24. (Amended) The method of claim 22, wherein ~~the opening through the dielectric material comprises a via having a cross-sectional area and a volume, and a trench to the via having a cross-sectional area greater than the cross-sectional area of the via, and~~ introducing the shunt material comprises introducing the shunt material to substantially fill the volume of the via.